

I CLAIM AS MY INVENTION:

1. An implantable heart monitoring device comprising:
a control circuit;
a first sensor adapted to be disposed in a coronary sinus region of a heart to sense at least one constituent of blood, and supplying a first sensor signal representing said constituent to the control circuit;
at least one further sensor adapted to interact with the heart to sense activity of the heart, said at least one further sensor supplying a further sensor signal representing said activity to the control circuit; and
said control circuit, from said further sensor signal, identifying first and second portions of a heart cycle of the heart, and from said first sensor signal, determining a first value related to said blood constituent during said first portion and determining a second value related to said blood constituent during said second portion.
2. An implantable heart monitoring device as claimed in claim 1 wherein said control circuit, from said further sensor signal, detects said first value in said first portion during a diastolic portion of the heart cycle, and detects said second value in said second portion during a systolic portion of the heart cycle.
3. An implantable heart-monitoring device as claimed in claim 2 wherein said control device detects said second value in said second portion within a final 70% of said diastolic portion.
4. An implantable heart-monitoring device as claimed in claim 1 wherein said first sensor senses blood oxygen as said blood constituent.

5. An implantable heart-monitoring device as claimed in claim 1 wherein said control circuit detects said first and second values in each of a plurality of heart cycles of the heart.

6. An implantable heart monitoring device as claimed in claim 1 comprising a therapeutic device adapted to executed a measure related to cardiac therapy, wherein said control circuit emits a trigger signal to said therapeutic device upon an occurrence selected from the group consisting of said first value fulfilling a predetermined condition, said second value fulfilling a predetermined condition, and a relationship between said first value and said second values fulfilling a predetermined condition.

7. An implantable heart monitoring device as claimed in claim 6 wherein said occurrence is said relationship between said first value and said second value fulfilling a predetermined condition, and wherein said predetermined condition is said first value being lower than a first predetermined level and said second value being higher than a second predetermined level.

8. An implantable heart monitoring device as claimed in claim 6 wherein said occurrence is said relationship between said first value and said second value fulfilling a predetermined condition, and wherein said predetermined condition is said first value decreasing by more than a first predetermined amount over a plurality of heart cycles while said second value decreases less than a second predetermined amount over said plurality of heart cycles.

9. An implantable heart monitoring device as claimed in claim 6 wherein said therapeutic device is a stimulation pulse generator which emits stimulation pulses adapted to be supplied to the heart, and wherein said measure is controlling delivery of said stimulation pulses to the heart.

10. An implantable heart monitoring device as claimed in claim 6 wherein said therapeutic device is a drug delivery device adapted to deliver a drug to a subject in whom said heart monitoring device is implanted, and wherein said measure is controlling delivery of said drug.

11. An implantable heart-monitoring device as claimed in claim 6 wherein said therapeutic device is a warning signal generator, and wherein said measure is to emit a warning signal.

12. An implantable heart monitoring device as claimed in claim 6 further comprising an activity level sensor adapted to sense a level of physical activity of a subject in whom the heart monitoring device is implanted, said activity sensor supplying an activity level signal to said control circuit, and said control circuit determining whether to emit said control signal dependent on said occurrence and said activity level.

13. An implantable heart monitoring system comprising:

a control circuit;

a lead arrangement connected to said control circuit and adapted for implantation in a subject;

a first sensor carried by said lead arrangement and adapted to be disposed in a coronary sinus region of a heart to sense at least one constituent of blood, and supplying a first sensor signal representing said constituent to the control circuit;

at least one further sensor carried by said lead arrangement and adapted to interact with the heart to sense activity of the heart, said at least one further sensor supplying a further sensor signal representing said activity to the control circuit; and

said control circuit, from said further sensor signal, identifying first and second portions of a heart cycle of the heart, and from said first sensor signal, determining a first value related to said blood constituent during said first portion and determining a second value related to said blood constituent during said second portion.

14. An implantable heart monitoring system as claimed in claim 13 wherein said control circuit, from said further sensor signal, detects said first value in said first portion during a diastolic portion of the heart cycle, and detects said second value in said second portion during a systolic portion of the heart cycle.

15. An implantable heart-monitoring system as claimed in claim 14 wherein said control device detects said second value in said second portion within a final 70% of said diastolic portion.

16. An implantable heart-monitoring system as claimed in claim 13 wherein said first sensor senses blood oxygen as said blood constituent.

17. An implantable heart-monitoring system as claimed in claim 13 wherein said control circuit detects said first and second values in each of a plurality of heart cycles of the heart.

18. An implantable heart monitoring system as claimed in claim 13 comprising a therapeutic device adapted to executed a measure related to cardiac therapy, wherein said control circuit emits a trigger signal to said therapeutic device upon an occurrence selected from the group consisting of said first value fulfilling a predetermined condition, said second value fulfilling a predetermined condition, and a relationship between said first value and said second values fulfilling a predetermined condition.

19. An implantable heart monitoring system as claimed in claim 18 wherein said occurrence is said relationship between said first value and said second value fulfilling a predetermined condition, and wherein said predetermined condition is said first value being lower than a first predetermined level and said second value being higher than a second predetermined level.

20. An implantable heart monitoring system as claimed in claim 18 wherein said occurrence is said relationship between said first value and said second value fulfilling a predetermined condition, and wherein said predetermined condition is said first value decreasing by more than a first predetermined amount over a plurality of heart cycles while said second value decreases less than a second predetermined amount over said plurality of heart cycles.

21. An implantable heart monitoring system as claimed in claim 18 wherein said therapeutic device is a stimulation pulse generator which emits stimulation pulses adapted to be supplied to the heart, and wherein said measure is controlling delivery of said stimulation pulses to the heart.

22. An implantable heart monitoring system as claimed in claim 18 wherein said therapeutic device is a drug delivery device adapted to deliver a drug to a subject in whom said heart monitoring device is implanted, and wherein said measure is controlling delivery of said drug.

23. An implantable heart-monitoring system as claimed in claim 18 wherein said therapeutic device is a warning signal generator, and wherein said measure is to emit a warning signal.

24. An implantable heart monitoring system as claimed in claim 18 further comprising an activity level sensor adapted to sense a level of physical activity of a subject in whom the heart monitoring device is implanted, said activity sensor

supplying an activity level signal to said control circuit, and said control circuit determining whether to emit said control signal dependent on said occurrence and said activity level.

25. An implantable heart monitoring system as claimed in claim 13 wherein said lead arrangement includes a first lead carrying said first sensor, and wherein said implantable heart monitoring system further comprises an electrode also carried on said first lead, said first lead having a distal end and said electrode being carried on said first lead closer to said distal end than said first sensor, and wherein said first lead is adapted to introduce said electrode via the coronary sinus into a cardiac vein.

26. An implantable heart monitoring system as claimed in claim 25 wherein said control circuit includes circuitry for generating stimulation pulses, and wherein said stimulation pulses are delivered via said first lead and said electrode.

27. An implantable heart monitoring system as claimed in claim 25 wherein said lead arrangement includes a second lead carrying a further electrode adapted for positioning in the right ventricle of the heart.

28. A heart monitoring method comprising the steps of:

disposing a first sensor in a coronary sinus region of a heart and sensing at least one constituent of blood with said first sensor, and generating a first sensor signal representing said constituent;

disposing at least one further sensor adapted to interact with the heart and sensing activity of the heart with said at least one further sensor, and generating a further sensor signal representing said activity; and

from said further sensor signal, electronically identifying first and second portions of a heart cycle of the heart, and from said first sensor signal, electronically determining a first value related to said blood constituent

during said first portion and a second value related to said blood constituent during said second portion.

29. A heart monitoring method as claimed in claim 28 comprising, from said further sensor signal, electronically detecting said first value in said first portion during a diastolic portion of the heart cycle, and electronically detecting said second value in said second portion during a systolic portion of the heart cycle.

30. A heart monitoring method as claimed in claim 29 comprising electronically detecting said second value in said second portion within a final 70% of said diastolic portion.

31. A heart monitoring method as claimed in claim 28 comprising sensing blood oxygen as said blood constituent.

32. A heart monitoring method as claimed in claim 28 comprising electronically detecting said first and second values in each of a plurality of heart cycles of the heart.

33. A heart monitoring method as claimed in claim 28 comprising executing a therapeutic measure related to cardiac therapy, upon an occurrence selected from the group consisting of said first value fulfilling a predetermined condition, said second value fulfilling a predetermined condition, and a relationship between said first value and said second values fulfilling a predetermined condition.

34. A heart monitoring method as claimed in claim 33 wherein said occurrence is said relationship between said first value and said second value fulfilling a predetermined condition, and wherein said predetermined condition is said first value being lower than a first predetermined level and said second value being higher than a second predetermined level.

35. A heart monitoring method as claimed in claim 33 wherein said occurrence is said relationship between said first value and said second value fulfilling a predetermined condition, and wherein said predetermined condition is said first value decreasing by more than a first predetermined amount over a plurality of heart cycles while said second value decreases less than a second predetermined amount over said plurality of heart cycles.

36. A heart monitoring method as claimed in claim 33 comprising emitting to the heart, and controlling delivery of said stimulation pulses to the heart as said therapeutic measure.

37. A heart monitoring method as claimed in claim 33 comprising delivering a drug to the subject in whom said heart monitoring device is implanted, and controlling delivery of said drug as said therapeutic measure.

38. A heart monitoring method as claimed in claim 33 comprising to emit a warning signal as said therapeutic measure.

39. A heart monitoring method as claimed in claim 33 comprising sensing a level of physical activity of the subject in whom the heart monitoring device is implanted, and generating an activity level signal, and electronically determining whether to emit said control signal dependent on said occurrence and said activity level.